Landfill Closure, Intermediate Cover & Post-Closure Care

Municipal League Meeting 9-7-17
Gated and Closed Landfill

**Gated** means no longer accepting waste. **Closed** means gated and final cover has been installed in compliance with the approved closure plan and closure certified by engineer, and closure certificate issued.
The goals of a good closure plan are to implement a site specific design that meets the requirements of the Rules.

Design and construction *must isolate waste from the environment to limit potential future detrimental impacts to groundwater, the public health, and environment;*
Closure Activities Include

- **Placement of final cover/cap** in accordance with the approved Closure Plan.

- **Adequately control surface water run-on and run-off.** Use of berms, rip-rap reinforced channels, culverts, and proper slopes to prevent creation of erosion rills and water channels.

- **Establish and maintain appropriate vegetative cover** or use other methods such as desert pavement.

- **Install and repair fencing** and access to site, and post signs.

- **Monitor methane** (landfill gas) and groundwater. Install any additional wells gas monitoring points as necessary.
Intermediate Cover

Should not be left in place longer than 2 years
Final Closure at Open Landfills

- Consider installation of final cover at areas with intermediate at open landfills that have not received waste in more than 2 years or that have reached final grade, or that is no longer in fill progression areas.

- **WHY?**
  - Reduces the amount of acreage that is included in the Financial Assurance Estimate – saves $$$.
  - Allows for early establishment of vegetative cover.
Measurement of Final Cover

During Construction Confirmation Measurements Necessary to Document Correct Depth of Final Cover
The Right Kind Vegetative Cover—Why is it so Important?

Establishing the right kind of vegetation on a landfill cap is important because:

- Roots hold the soil in place and helps to prevent wind and precipitation erosion;
- Through transpiration, plants pull excess moisture from the cap helping to prevent downward migration of water into the waste mass;
- Plant roots provide treatment for some contaminants in water.
Implement a Viable Erosion Control Plan at Your Landfill

- Plan needs to address interim and final controls;
- Include specific measures that will be used;
- Detail how they will be implemented and installed;
- Have plans, specifications for placement of desert pavement, woodchips, compost, rip rap or other mechanisms you will use.
Vegetation Establishment by Slope

Natural Resources Conservation Services Diagram
Vegetation Difficult to Establish

Think Out of the Box in New Mexico

Use Alternatives:

- Mulch slopes with wood chips, or straw;
- Use Compost;
- Try Desert Pavement (scattered gravel small stones);
- Construct riprap berms or use gabions (leaky dams);
- Install contour swales
Other Erosion Control Methods

Woodchips and compost low cost method to help prevent erosion at landfills

Rip-Rap armored drainage channels held during storm
Mulch and Seeding Comparison

Proper installation of Mulch prevents erosion
Wood Chip Mulch

As the pictures show the slope has been stabilized and a swale installed that still continues to function. The mulched slope helped retain moisture in the ground resulting in more and healthier native plants than compared un-mulched slope.
### Typical Mulching Application Rates

<table>
<thead>
<tr>
<th>Material</th>
<th>Rate per acre</th>
<th>Requirements</th>
<th>Notes</th>
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<tbody>
<tr>
<td><strong>Organic Mulches</strong></td>
<td></td>
<td></td>
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<tr>
<td>Straw</td>
<td>1 – 2 tons</td>
<td>Dry, unchopped, unweathered; avoid weeds</td>
<td>Spread by hand or machine; must be tacked or tied down</td>
</tr>
<tr>
<td>Wood fiber or wood cellulose</td>
<td>½ – 1 ton</td>
<td></td>
<td>Use with hydroteeder; may be used to tack straw; do not use in hot, dry weather</td>
</tr>
<tr>
<td>Wood chips</td>
<td>5 – 6 tons</td>
<td>Air dry; add fertilizer N, 12 lb/ton</td>
<td>Apply with blower, chip handler, or by hand; not for fine turf areas</td>
</tr>
<tr>
<td>Bark</td>
<td>35 yd³</td>
<td>Air dry, shredded, or hammermilled, or chips</td>
<td>Apply with mulch blower, chip handler, or by hand; do not use asphalt tack</td>
</tr>
</tbody>
</table>

Source: EPA
Examples of Use of Compost

(Before) Erosion along State Highway 47 in College Station, TX, threatens this riprap slope. Left alone, the erosion would be expensive to repair.

(After) TxDOT smoothed the slope and applied erosion control compost. This photo shows the same slope 2 weeks after compost was applied.
Try Another Dry Cover Option

Desert Pavement

- By scattering stones and gravels on top of your vegetative layer at your landfill, you have the potential to stabilize the cap in place while giving seeds a micro climate to grow.

- Desert pavements are surfaces that create a veneer of angular or rounded rock fragments. The “pavement” is commonly only one or two fragments thick, that form a mosaic within a matrix of fine sediment of sand, silt, and/or clay. Coarse fragments include alluvial pebbles, gravel, and cobbles, or debris weathered from bedrock.

- For example, in the older portion of the unlined T or C Landfill, desert pavement developed on-site naturally over time. This veneer has helped the vegetation to take hold.

- Scattering stones and gravel is a less expensive reasonable approach, because it does not require a cover of stones and gravel, just a random scattering.
Old Los Alamos County Landfill
Desert Pavement

Prevents need for significant slope and deep rill repairs. Reduces closure maintenance costs.

During 500 year flood event, Desert pavement scatted stones and gravel provided maximum control of surface water run-on run-off at this site.
Los Alamos County Landfill
500 Year Storm Erosion
Recent Unlined Landfill Closures
Reserve & Socorro

Reserve Closed Landfill
June 18, 2014
View looking South toward stormwater storage pond
Sponges and Contour Swales

Sponges are buried organic matter used to improve water absorption and retention in the soil. Sponges can be made out of straw-bales, straw-bale flakes or mulch.

Contour swales capture and slow water to prevent slope erosion.
Gabion Feature and Rip Rap Armoring

Gabions are “leaky dams” mainly used in areas of concentrated water flow such as arroyos, or to create a check dam or drop structure. Don’t have to be in wire basket.

Rip Rap installation on slope swales no failure during 500 year storm at Los Alamos LF.
Owner/Operator Responsibilities

Check closed landfill cell or site on a regular basis for the following:

- Depressions especially on the top;
- Excess vegetation in one location or inappropriate vegetation such as deep rooted shrubs and trees;
- Presence of rills or drainage gulley formation on side slopes;
- Water erosion into the toe of the landfill slope
- Animal burrows into landfill;
- Fence integrity;
- Illegal dumping
- Patches of dead vegetation.
Operator Responsibilities (Continued)

- Minimize vehicle or animal traffic on the cap (fencing/gating)
- Check leachate collection basins if installed;
- Monitor methane gas at the perimeter of the site in accordance with the approved plan;
- Confirm that consultant is completing groundwater monitoring in accordance with the GW Monitoring Plan.
- Check methane gas levels and passive or active methane vents if installed to determine if working properly;
- Ensure that appropriate vegetation is taking hold or is growing properly. Re-seed or use other methods as necessary;
- Apply wood chips/mulch or other materials perpendicular to slopes to slow rainfall, and to encourage vegetation growth.
Cracking of Intermediate or Final Cover.

Depressions from differential settling of areas on cap. Ponding of water can increase methane generation.
Methods to Control Differential Settlement

- Blend Organic and inorganic wastes;
- Good Compaction;
- Keeping working area smooth and uniform;
- Grade surfaces to promote water run-off;
- Check for cracks in cover, standing water, or depressions;
- Fill depressions as soon as noticed;
What Are These?

Rills

Cause?

Why

Problem?

Remedy?
Rill and Slope Maintenance

Tracking involves roughening a bare soil with horizontal grooves. Tracking reduces runoff velocity and reduces erosion. Works best with seeding. Note does not work well in sandy soils.
What Is Wrong?
Is This Acceptable?

Wrong Type of Vegetation

Why a Problem?

How Would You Fix This?
Storm Damage – Repair ASAP
Patches of Dead Vegetation

Cause?

Why Problem?

Remedy?
Methane Sampling

If Methane is found greater than 5% by volume in air by volume at property boundary. Does this exceed the Lower Explosive Limit (LEL)?

If, yes Why Problem?

Cause?

Remedy?
Is This Situation Acceptable?

What is Problem?

Remedy?
Is Anything Wrong With These Monitoring Wells?

What would you do?
Properly Maintained GW Well
Owners/Operators - First Line of Defense To Limit Future Post-Closure Care Costs!

- Routine checks, and immediate repairs limits future liability by ensuring that water does not infiltrate the waste mass.
- Remember the goal of a landfill is to entomb and isolate the waste from the environment, especially water; and
- Timely, inexpensive repairs will help prevent major expensive mitigation later.
Check For and Inhibit Animals

Animals cause problems at closed landfills –
Questions?

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